

Comparing laser interferometry and atom interferometry approaches to space-based gravitational-wave measurement.

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Abstract:

Thoroughly studied classic space-based gravitational-wave missions concepts such as the Laser Interferometer Space Antenna (LISA) are based on laser-interferometry techniques. Ongoing developments in atom-interferometry techniques have spurred recently proposed alternative mission concepts. These different approaches can be understood on a common footing. We present an comparative analysis of how each type of instrument responds to some of the noise sources which may limiting gravitational-wave mission concepts. Sensitivity to laser frequency instability is essentially the same for either approach. Spacecraft acceleration reference stability sensitivities are different, allowing smaller spacecraft separations in the atom interferometry approach, but acceleration noise requirements are nonetheless similar. Each approach has distinct additional measurement noise issues.